Charaterising Calls of the Yellow-breasted Boubou (*Laniarius atroflavus*) & Potential Habitat Effects

S.T. Osinubi[1,2*], J. Briskie[1], U. Ottosson[3], J.A. Brown[4] and H.M. Chapman[1,2]

1. School of Biological Sciences, University of Canterbury, Christchurch, New Zealand.
2. Nigerian Montane Forest Project, Ngel Nyaki Forest Reserve, Taraba State, Nigeria.
3. A.P. Leventis Ornithological Research Institute, Jos, Plateau State, Nigeria.
4. Department of Maths and Statistics, University of Canterbury, Christchurch, New Zealand.

*taymida@yahoo.co.uk

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Introduction

Vocalisation serves an important communication function in birds but most research is limited to temperate species and little information is available on tropical forest species. The yellow-breasted boubou *Laniarius atroflavus* is a range-restricted sub-oscine species (family: Malaconotidae) inhabiting the rugged terrain of the Nigerian-Cameroon Highland biome, which is severely threatened by anthropogenic pressure.
Between 2009 and 2010, boubous in the Ngel Nyaki Forest Reserve of Taraba State, Nigeria, were observed and recorded to:

- identify the different calls in their repertoire,
- ascribe possible functions to each call, and
- assess differences in acoustic measures between individuals holding territories in escarpment forest edge and in riparian fragment habitats (fig. 1).

Figure 1: Satellite imagery of the study area, with polygons indicating delineated territories and dots indicating territories with insufficient boundary delineation. Inserts show (counter-clockwise from top) map of West Africa and Nigeria with study site marked (X), photo of edge habitat, and photo of riparian habitat.

Materials & Methods

Records were made using the Marantz PMD661 digital recorder with a ME67/K6 Sennheiser shot-gun microphone, and examined using Raven Pro 1.4 and XBAT (fig. 2). Focal observations and recordings provided information for identifying calls and call functions, and these were conducted whenever boubous were encountered. Environmental recordings were explored for habitat effects, and these records were taken in the morning (0530-0930) within identified territories using an unmanned recording unit.

Figure 2: Recording equipment used for both focal and environmental recordings.

Results & Discussion

Four call types were identified:

- single-peaked call or inverted U profile as described by Grimes (1976) with an average minimum frequency of 0.79 kHz, maximum frequency of 3.08 kHz and each call lasting approximately 0.30 sec; pairs in other territories responded vocally to this call type and did so with a similar call, suggesting it functions as a territorial call (fig. 3i).
- multi-peaked call with an average minimum frequency of 0.96 kHz, maximum frequency of 3.20 kHz and duration lasting approximately 0.44 sec; recorded between members of a territorial pair, suggesting it functions in mate-guarding or to maintain contact (fig. 3ii-iii).
- clicked duet response or described as a 'chook' by Serle (1965); recorded in reply to both the single- and multi-peaked calls, and was observed to be produced by both individuals of the pair. Usually a single reply to each call, but multiple replies to a single call were recorded.
- alarm call; sounded like a rasp and is produced when an observer approached the bird or nest, or when the bird was mobbing a threat (fig. 3iv).

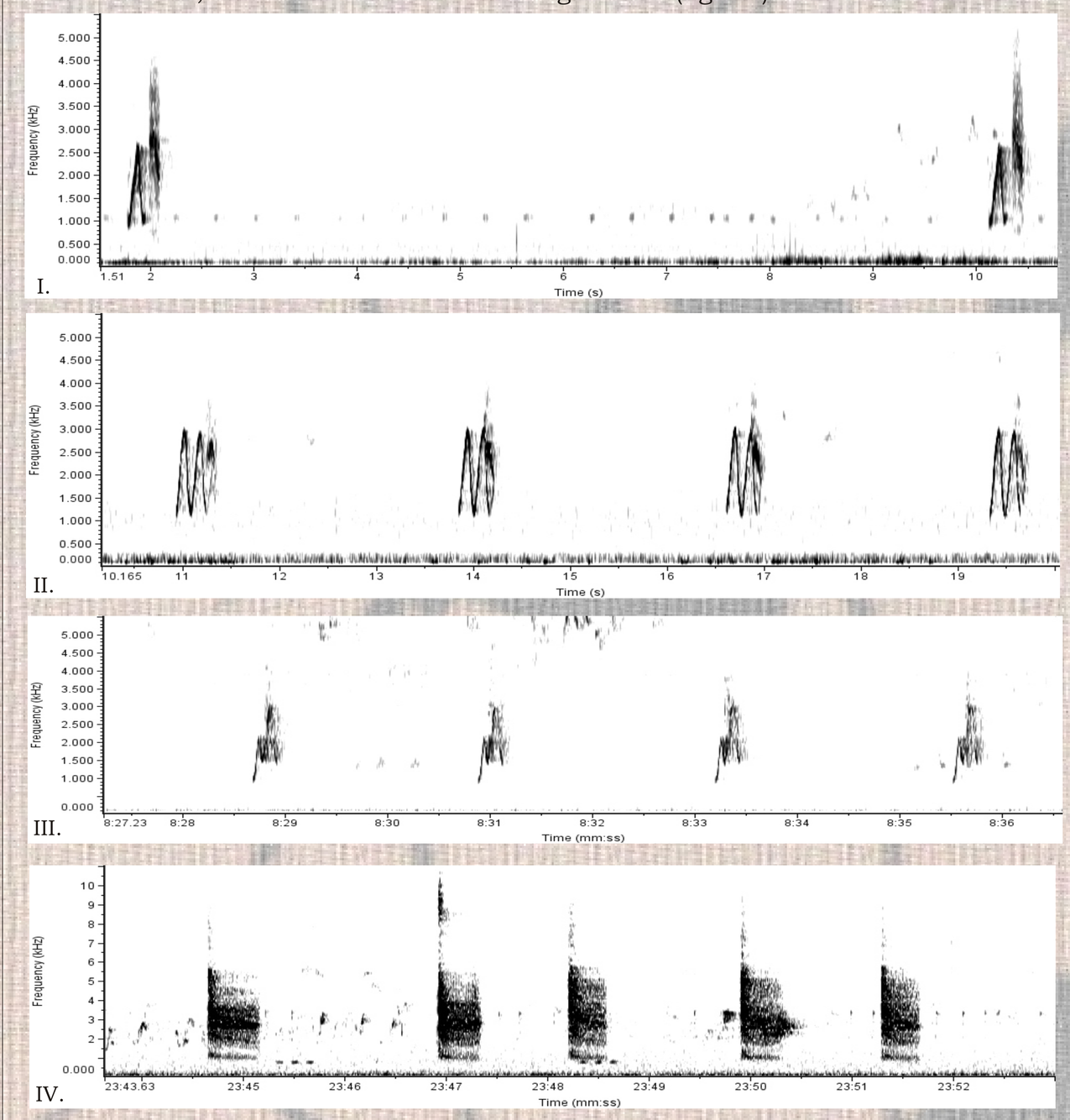

Figure 3: Spectrograms showing (I) single-peaked call with clicked duet response, (II) multi-peaked call with clicked duet response, (III) a variant of the multi-peaked call without clicked duet response, and (IV) alarm call.

Calls recorded in the riparian habitat covered a wider bandwidth range – lower in the minimum frequency – and had a longer duration than calls in the forest edge (table 1). Lower frequency may allow for better sound propagation in the denser undergrowth of the riparian habitat.

Table 1: Differences in acoustic parameters of single- and multi-peaked call types between edge and riparian habitats.

	Single-peaked calls			Multi-peaked calls		
Acoustic measures	Edge	Riparian	Statistics	Edge	Riparian	Statistics
Minimum frequency (kHz)	0.78 ± 0.13	0.74 ± 0.17	$F_{1,676} = 10.38$, $p < 0.01$	0.98 ± 0.07	0.92 ± 0.13	$x^2_{1,N=321} = 26.79$, $p < 0.01$
Maximum frequency (kHz)	3.48 ± 0.68	3.44 ± 0.66	$F_{1,676} = 0.58$, $p = 0.45$	3.38 ± 0.36	3.59 ± 0.61	$x^2_{1,N=321} = 0.19$, $p = 0.67$
Bandwidth (kHz)	2.7 ± 0.73	2.70 ± 0.74	$F_{1,676} = 0.004$, $p = 0.95$	2.40 ± 0.37	2.68 ± 0.68	$x^2_{1,N=321} = 4.08$, $p = 0.04$
Inter-quartile* bandwidth (kHz)	0.74 ± 0.23	0.79 ± 0.30	$x^2_{1,N=678} = 8.81$, $p < 0.01$	0.65 ± 0.19	0.65 ± 0.20	$F_{1,319} = 0.03$, $p = 0.86$
Duration (sec)	0.33 ± 0.07	0.35 ± 0.14	$x^2_{1,N=678} = 1.96$, $p = 0.16$	0.44 ± 0.06	0.47 ± 0.08	$F_{1,319} = 14.60$, $p < 0.01$
Inter-quartile* duration (sec)	0.09 ± 0.06	0.10 ± 0.04	$x^2_{1,N=678} = 13.05$, $p < 0.01$	0.13 ± 0.05	0.14 ± 0.05	$F_{1,319} = 3.46$, $p = 0.06$
Number of calls recorded	393	285		107	214	

*Inter-quartile measurements are the difference between the first and third quartile value of a measured parameter.

Conclusion

L. atroflavus does not have as diverse a repertoire as its closest congenerics, but both individuals of a territorial pair can produce the four call types, refuting reports that only males initiate and females respond to duets in this species. Habitat structure does appear to influence the vocalisation of the boubous, with a shift in the lower frequency range. If single-peaked calls serve a territorial function, then birds in the edge habitats appear to communicate their territorial presence to conspecifics than individuals in riparian habitats, while birds in the riparian habitats appear to engage in more calls between the pair, as suggested by more single-peaked calls coming from the edge habitat and more multi-peaked calls from the riparian habitat, respectively.

All recordings are archived and available online at the Macaulay Library of the Cornell Laboratory of Ornithology (http://macaulaylibrary.org/).

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